Saprolegniosis

Ulcerative Dermal Necrosis (UDN), Salmon Disease, Winter Killer

Introduction

Water molds belonging to Oomycetes, Saprolegniaceae, are the most important fungi affecting cultured freshwater fish and are considered by some specialists to occur secondary to bacterial diseases in terms of economic importance to aquaculture.

Among water molds, the genus *Saprolegnia* (family *Saprolegniacea*) those consider as a ubiquitous component of aquatic environment. However, the species of *Saprolegnia* implicated in fish pathology are probably best considered as those in which the fish are the major substratum.

On the other way, it would appear that many of *Sapolegnia* spp. causing out breaks of saprolegniasis act as primary pathogen rather than opportunistic one, and they are capable of infecting fish in the absence of existing bacterial or viral agent (s).

Historical view of saprolegniosis

By the late years of eighteenth century, a fungal disease affecting the skin of salmons was first detected in the British Isles and nominated as “Salmon disease”. Then, the disease was recorded on specific rivers of British, Wales and Scotland and the syndrome tock another name that was ulcerative dermal necrosis.

In the early sixties, occasional fish with lesions characteristic for the disease were seen in the Waterville river system of south west of Ireland but the disease has since spread to the rest of Ireland. Since the disease first recognized it has spread throughout European water and in 1977, it was reported in Sweden for the first time.

Nowadays, such infection is usually categorized under the heading “saprolegniasis” and it is considered that *Saprolegnia* species behave as opportunistic necrotrophs.

In Japan the story of saprolegniasis has started dramatically by different way. The disease caused a great deal of damage and high mortalities in eel-culture ponds including different life stages of the fish and the causative agent was suspected to be *S. parasitica* Coker. A few years later, the disease spread among salmonid fishes and other fishes.

In USA, the disease caused great problems with catfish, which let fish specialists to nominate the disease as "Winter- killer". Since the disease recognized it has spread throughout American water and attacked salmonids as well as other fish.

Definition

"***One of the prevalent chronic diseases of all freshwater and brackish water fishes specially young stages (fingerlings, Juveniles…etc), cultured and aquarium fishes, and even eggs but not affect marine fishes, characterizing by fluffy white to grayish cotton-like fungal growth mass on the skin, gills, and fins, high morbidity & mortality among young fishes, local ulceration and subdermal necrosis in advanced cases***".

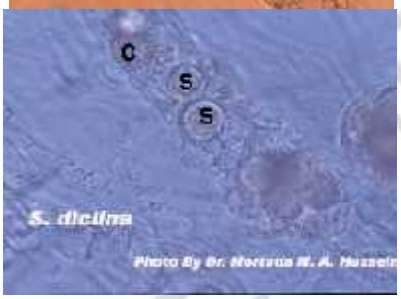
Etiology

Some members of the genus Saprolegnia:

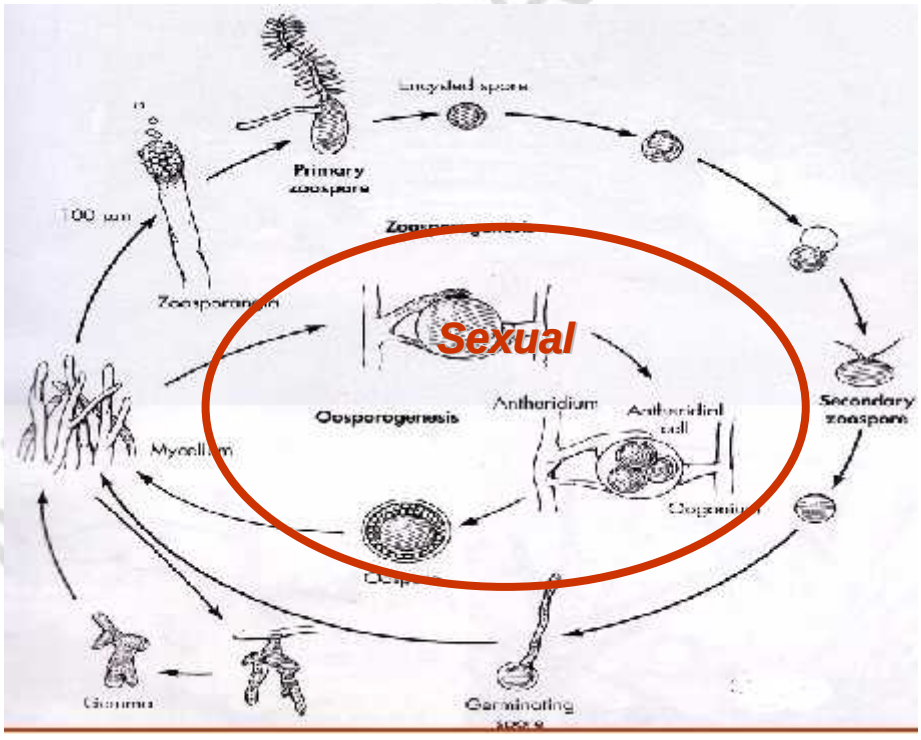
S. parasitica, S. salmonis, S. ferax, S. australis and S. diclina

Most of these *Saprolegnia* spp. are saprobes or facultative saprobes, however, it would appear that many of *Saprolegnia* spp. causing out breaks of saprolegniosis act as primary pathogen rather than opportunistic one (e. g. *S. parasitica, S. salmonis, S. declina* type I)

These fungi have long branched aseptated hyphae, reproduce primarily asexually through formation of zoosporangia on fertile hyphae, zoosporangia long, cylindrical, double walled, and contain a large number of **zoospores** that discharged in the water, encysted and act as **infective stage** and germinate (under favorable) giving new hyphae.



Under unfavorable conditions, the fungus reproduces sexually through formation of Oogonia and Gemma elements. These structures could withstand the poor conditions and germinate again when the environment becomes suitable to give new hyphae, zoosporangia,…… and so on.



Susceptibility All freshwater fishes and their eggs are susceptible to catch the disease and infrequently brackish water fishes also could be infected (e. g. Mullets and drum fish).

Infections with the disease cause sever economic loss among fish

hatcheries. Living fish eggs are not susceptible to be attacked by any saprolegnia species, however, dead eggs considered as good fertile medium for the growth of the fungus leading to suffocation and invasion of the living ones by the growing hyphae.

Predisposing Causes (stressors)

- Overcrowding and physical trauma.
- Low dissolved oxygen.
- Presence of large amount of organic matter.
- Nutritional deficiencies and malnutrition especially among cultured fishes.
- Injuries of the skin or gill either by trauma or ectoparasites.
- Temperature variation (low temperature, 18~20° C) together with alternations with pH levels.
- Physiological alternation during spawning season.
- Rough handling especially during transportation.
- Sub-lethal level of toxic substances in the water (pollution).

Mode of infection

Mainly through injuries of skin and /or gills. Zoospores from infected aquatic animals, infected dead carcasses as well as polluted water with them act as the source of infection.

Transmission

The transmission or the spread of the disease is usually horizontal (from infected material to the fish and /or aquatic animals).

Source of infection

Contaminated water with the fungal elements consider as the main source infection particularly, inanimate sources (sporulated fungus on dead substrate). Infected fish and fish eggs are also important source of infection.

Pathogenesis

The lesion stated as superficial small focal infections that spread rapidly over the body surface and rarely penetrate beyond the superficial muscular layers.

Destruction of the integument (skin & gills) lead to loss of serum electrolytes and proteins, which is the primary cause for fatal termination.

Disease signs

Whitish to grayish cotton-like fungal growth on the skin, gills, and / or eyes of the infected salmonid fish, which can be seen only when the infected fish present in the water.

Glistening slimy matted mass on the body

When the gills infected respiratory distress occurred

Disease signs

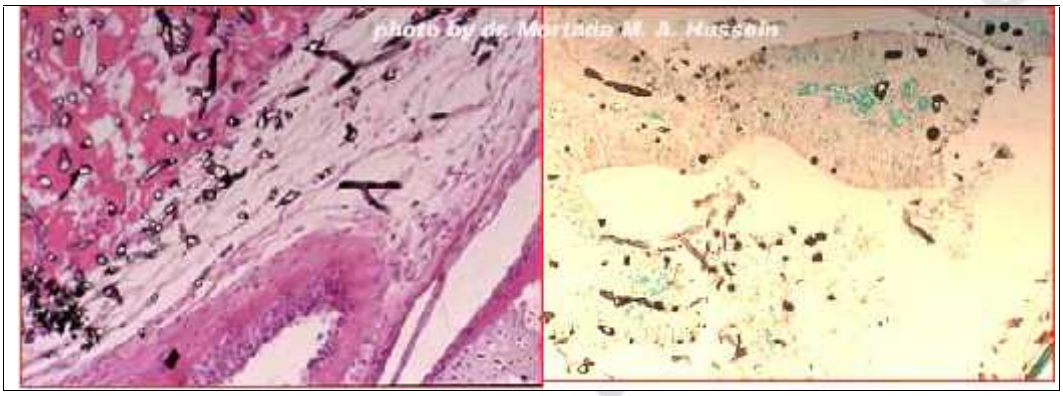
When the life eggs get infected suffocation and death occurred

In advanced cases, skin ulceration together with exposure of the muscular layer under the skin

Postmortem Findings

- In mild cases gross pathology not clear, while in sever ones slimy grayish brown patches distributed on the affected areas together with haemorrhages, erosions and ulceration of the skin.
- Destruction of the gills was also reported.
- No internal lesions.

Microscopic Pathology



- Degenerative and necrotic changes in the skin & gills accompanied with fungal mycelia deeply into the underling muscle.
- Hyperplastic proliferation and \ or destruction of the epithelial linings accompanied with the invading fungal elements.

Diagnosis

I. *Case history* revealed that:

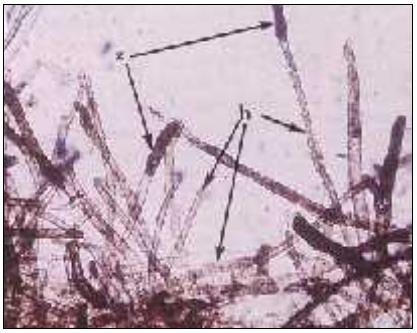
- Presence of Whitish to grayish cotton-like fungal growth on the skin, gills, and / or eyes.
- Sluggish swimming and loss of appetite.
- Presence of little mortality.

II. The *disease signs* (as mentioned above).

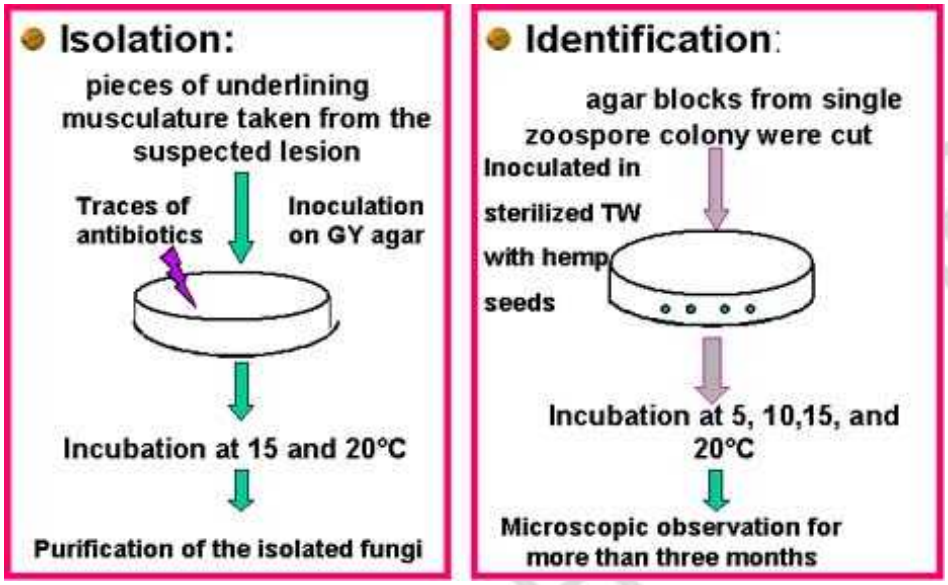
III. P. M. findings.

IV. Laboratory diagnosis:

- **Wet mount preparation from skin and / or gills to detect the hyphal growth and /or the zoosporangia**



- Isolation and identification:



- Histopathological findings (as mentioned above).

Therapy & Control

Chemotherapy

Increase the water flow and aeration is the first step for treatment, then antiseptic bathes are recommended specially in early stages of infection.

For nearly more than sixty years the compound of choice for the control of Oomycetes, particularly *Saprolegnia* infection, in aquaculture has been malachite green. In fact, **malachite green** is the most potent fish fungicide but it has an acute impact on aquatic ecosystems, has an immunosuppressive effect on repeatedly treated fish, teratogenic, and it result in hazardous residues in fish tissue.

For these reasons, the use of malachite green was terminated in United States of America and the need for a replacement fungicide has intensified.

Presently, **formalin** has been used as an effective fungicide, however, it is approved only for use on the eggs of salmonids and esocids. In addition, the use of formalin has increased causing more awareness about user safety and the chemical's impact on the environment.

Recently, much current research has focused on **hydrogen peroxide** because it is safer to use than formalin and appears useful for hatchery water currents, as it is decomposed into water and oxygen via enzymatic catalysts found in most bacterial cells.

Yet, while attempts are being made to identify new antifungal agents against *Saprolegnia*, biological control of this organism has received little attention. As one of the methods for preventing infectious diseases, the **biocontrol** that is a microbial technique using the interaction of microorganisms to repress the growth of deleterious microbes or pathogens.

Control

Good hygiene and removal of all stressors is the proper way for disease control this can be achieved through:

- Avoid overcrowding.
- Proper disposal of dead and dying fishes either by burning or burying.
- Control of aquatic animals such as reptiles and amphibians.
- Proper disposal of infected fish if in small number.
- Proper drainage, drying, and disinfectant of the pond (quick lime 4 tone/acre.